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(19) Japanese Patent Office (JP)  
(12) Publication of Unexamined Patent Application (A)

(11) Unexamined Patent Application No.: S55-29002  
(43) Unexamined Patent Application Date: March 1, 1980  
Request for Examination: Yes  
Number of Claims: 1  
Total pages: 6

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(51) Int. CL <sup>X</sup>	Identification Symbol	JPO File Number	FI	Technology Display Area
F 02 D	17/00	7910-3G		
	5/02	6355-3G		

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(54) Title of Invention: Fuel Supply Control Variable Cylinder System

(21) Patent Application No.: S55-29002

(22) Patent Application Date: July 17, 1978

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## **Specification**

### **Title of Invention**

**Fuel Supply Control Variable Cylinder System**

### **Claim(s)**

1. A fuel supply control type variable cylinder system for multi-cylinder engines equipped with a fuel supply system and a variable cylinder control circuit that permit partial cylinder operation by shutting off the supply of fuel to a specified group of cylinders from the fuel supply system depending on engine load, comprising a three-way catalyst and a first oxygen sensor located in the exhaust passage of the active cylinder group; a three-way catalyst and a second oxygen sensor located in the merged passage where the exhaust passage of the inactive cylinder group meets the downstream of the exhaust passage mentioned above; a selection circuit that selects the output of the first oxygen sensor under partial cylinder operation or the output of the second oxygen sensor under full cylinder operation depending on shut-off of the variable cylinder system circuit mentioned above; a temperature detection means that detects the temperature of the three-way catalyst in the merged passage; and an air-fuel ratio control circuit in which the fuel supply signal mentioned above terminates the shut-off operation when the temperature detection means detects that the temperature is below a specified value, while interrupting the air-fuel ratio control that controls the fuel supply signal in such a manner so as to make the air-fuel ratio become equal to the stoichiometric value.
2. The fuel supply control type variable cylinder system described in claim 1, a unique feature of which is that the temperature detection means mentioned above represents a circuit that determines the temperature by detecting that one portion of said fuel supply signal is shut off and that the output of the second oxygen sensor is higher than a specified value.

### **Detailed Explanation of the Invention**

This invention concerns a fuel supply control type variable cylinder system engine equipped with a three-way catalyst in the exhaust system to feedback-control the air-fuel ratio; in particular, a system in which degradation of the exhaust emission control operation is prevented by resuming the full cylinder operation whenever the catalyst temperature decreases.

Generally speaking, engine fuel economy tends to improve when the engine is operated under a heavy load condition. This is the reason the variable cylinder engine concept was developed for multi-cylinder engines to stop the fuel supply to one group of the cylinders under a light engine load so that the relative load per each of the remaining cylinders can be increased leading to improved fuel economy under light load conditions.

On the other hand, from the standpoint of exhaust emission control measures, there is a well known system in which a three-way catalyst is installed in the engine exhaust system, upstream of which an exhaust sensor (oxygen sensor) is installed. In this system, the air-fuel ratio is feedback-controlled to become approximately equal to the stoichiometric value based on the output of this exhaust sensor in order to achieve high efficiency oxidation of HC and CO concurrently with reduction of NOx.

When this air-fuel ratio control system is employed with a variable cylinder engine, when a cylinder

group is inactive, the air exhausted from these inactive cylinders is mixed with the combustion exhaust gas from the active cylinders before it passes through the oxygen sensor and the three-way catalyst. This results in oxygen sensor output that indicates an oxygen rich condition so the feedback control forces the system to make the air-fuel ratio extremely lean, which in turn tends to degrade fuel economy.

One measure to address this problem is to install oxygen sensors and three-way catalysts in the exhaust passage of the cylinders that are always active as well as in the merged exhaust passage in which the exhaust passages from the active cylinders and inactive cylinders are joined. When one portion of the cylinders is inactive, feedback control is performed based only on the output of the oxygen sensor through which the exhaust gas from the active cylinders passes making the air-fuel ratio of the combustion exhaust gas approximately equal to the stoichiometric value. In this manner, the system can achieve good fuel economy and emission control at the same time.

There is, however, a problem during the engine warm-up period or during the time when the partial cylinder operation lasts a long time. The exhaust gas temperature tends to become low under these conditions, especially the temperature of the downstream three-way catalyst. It undergoes a large-scale decrease from its normal activated condition resulting from the entry of exhausted air from the inactive cylinders.

When the engine resumes full cylinder operation after the decrease in catalyst temperature, it is difficult to achieve good reaction at the downstream three-way catalyst which results in partial degradation of its exhaust emission control performance. This phenomenon tends to occur when a vehicle starts climbing uphill after it has been driven on a gently sloping downhill under the partial cylinder mode for a long time.

In order to eliminate this type of problem, there have been measures such as installing temperature sensors in the three-way catalyst in the exhaust passages. Whenever these temperature sensors detect a decrease in catalyst temperature below a specified value, the variable cylinder control system mode is interrupted to restore the full cylinder mode and expedite a quick increase in catalyst temperature. This measure, however, requires special temperature sensors and, inevitably, leads to cost escalation.

There is another measure in which a low engine temperature condition is detected by the engine coolant temperature and interrupting the variable cylinder control system. However, this system is still unable to solve the problem when the full cylinder operation is resumed, and tends to lower engine response characteristics.

Moreover, in the air-fuel ratio feedback control system mentioned above, similar to the three-way catalyst, the output characteristics of the oxygen sensors also tend to fluctuate and deviate from the proportionality with respect to the oxygen concentration when its temperature is decreased, resulting in impairment of the feedback control accuracy.

In order to address this problem, a normal procedure is to "clamp" the feedback signal to maintain the air-fuel ratio at a fixed value so that feedback control of the air-fuel ratio can be temporarily interrupted when the temperature estimated from the output of the oxygen sensor is determined to be below a specified value.

Based on such background, this invention is designed to assure the exhaust emission control performance

of a variable cylinder engine to control the air-fuel ratio based on the output of the oxygen sensor, which is located near the exhaust inlet of the three-way catalyst for the partially active cylinders, and which has similar temperature characteristics as those of the three-way catalyst temperature. When the downstream oxygen sensor temperature decreases below a specified value, feedback control of the air-fuel ratio is interrupted while at the same time the variable cylinder control system operation is also interrupted to restore full cylinder operation. With this method, the three-way catalyst temperature can be quickly increased by the combustion exhaust from all cylinders to prevent a decrease in the three-way catalyst temperature so that the good exhaust emission control operation can be maintained. The purpose of this invention is to introduce a fuel supply type variable cylinder engine that will achieve the performance explained above.

Next, a working example of this invention is presented using illustrations.

Number 1 represents the engine body, while f1 - f3 are inactive cylinders, the operation of which is stopped during the light load condition as explained later, and f4 - f6 are cylinders that are always active. Numbers 2a - 2f represent fuel injection valves installed in the intake ports of these cylinders, while 3 is an intake pipe, 4 a throttle valve, 5 an intake air flow sensor, and 6a and 6b are exhaust pipes for cylinder groups f1 - f3 and f4 - f6, respectively. 7 is a three-way catalyst installed in exhaust pipe 6b, and 8 is an oxygen sensor installed near the inlet of this three-way catalyst. 9 is a three-way catalyst installed in a merged pipe, 6, between exhaust pipes 6a and 6b, while 10 is an oxygen sensor installed near the inlet of three-way catalyst 9.

As described later, the air-fuel ratio control circuit, 12, receives the output of oxygen sensors 8 and 10 as input through a selection relay, 11, that performs the switching action based on the signal from a variable cylinder control circuit, 16, which is explained later. As depicted in Fig. 2, air-fuel ratio control circuit 12 is comprised of a comparator, 13, which compares the sensor output with the comparison standard voltage; a standard voltage setting device, 14, that outputs standard voltage corresponding to the stoichiometric air-fuel ratio; a correction waveform generation circuit, 16, that receives base pulses from a terminal, 15; a low catalyst temperature detector, 17, that detects the low temperature condition of oxygen sensor 10; and a clamp circuit, 20, which clamps (sets the air fuel ratio feedback valve at a specified value irrespective of the outputs of oxygen sensors 8 or 10) the feedback control value by receiving the low temperature signal from detector 17, and by receiving the full-throttle signal at the time of a fully open output and the fuel-cut signal at the time of deceleration from terminals 18 and 19.

A fuel injection control circuit (EGI circuit), 15, determines the amount of fuel injection based on the air-fuel ratio control signal from air-fuel ratio control circuit 12, and the signals from intake airflow sensor 5 and rpm sensor 21. Although the output of the EGI circuit is applied directly to fuel injection valves 2d - 2f, it is applied to other fuel injection valves 2a - 2c through a variable cylinder control circuit (VCS circuit, hereafter), 16. When a light load condition is detected by this VCS circuit 16, the fuel supply to fuel injection valves 2a - 2c is shut off making cylinders f1 - f3 inactive. At the same time, the system is designed such that selection relay 11 is switched to the side of oxygen sensor 8, which is exclusively provided for active cylinders f4 - f6 by the same signal generated by the VCS circuit 16 to decrease the

number of cylinders.

In principle, VCS circuit 16 is designed so as not to send the fuel injection pulse signal from EGI circuit 15 to fuel injection valves 2a ~ 2c during light load conditions making cylinders f1 ~ f3 inactive so that the fuel economy can be improved during light load conditions. The basic configuration is comprised of pulse comparators, 22 and 23, for the fuel injection signal having a pulse width proportional to engine load; pulse width setting devices, 24 and 25, that output the pulse setting values ( $W_H$ ) and ( $W_L$ ) corresponding to the heavy and light load conditions as comparison standard values; an engine rpm comparator, 26; an rpm setting device, 27, that makes the specified low rpm setting ( $N_0$ ) be the standard value; a flip-flop, 30, that sends the outputs from an "OR" circuit, 28, and an "AND" circuit, 29, to "set input (S)" and "reset input (R)" respectively; an "OR" circuit, 31, that inputs the output of this flip-flop 30 and the low temperature detecting device 17 of the air fuel ratio control circuit 12 mentioned above; and an "AND" circuit, 32, that receives the outputs of "OR" circuit 31 and EGI circuit as its inputs. In other words, since low temperature detecting device 17 is connected to the input side of "OR" circuit 31, the circuit is configured such that the partial cylinder deactivation command from VCS circuit 16 is cancelled when the temperature of oxygen sensors 8 and 10 is low.

Next, the operation of this invention is explained. Fig. 3 shows when engine rpm (N) and fuel injection pulse width (W) are in the 6-cylinder operation region. In this condition, as explained later, the output level of flip-flop 30 in the VCS circuit 16 becomes "1," and cylinders f1 ~ f3 are in the active condition, in other words, the system is in the full cylinder mode. After this, selection relay 11 is energized by receiving the output of "OR" circuit 31, which is "1" to perform the switching action, and the output of oxygen sensor 10, which detects the exhaust temperature of all cylinders, is input to air-fuel ratio control circuit 12. The output of comparator 13, which compares the oxygen concentration in the exhaust gas with the standard value corresponding to the stoichiometric air-fuel ratio generated by standard setting device 14, is fed back to EGI circuit 15 through clamp circuit 20 after it detects the deviation signal from the standard pulse at correction waveform generation circuit 16. Through these steps, the air-fuel ratio converges approximately to the stoichiometric value so that three-way catalyst 10 (sic) can function correctly. When the engine enters the light load condition, causing pulse width (W) and engine rpm (N) to shift to the 3-cylinder region indicated in Fig. 3, the output level of flip flop 30 becomes "0" and the operating condition of cylinders f1 ~ f3 becomes inactive. At this time, since low temperature detector 17 outputs the signal "0" indicating that oxygen sensor 10 is not at a temperature below the specified value, the output of "OR" circuit 31 becomes "0," closing the gate of "AND" circuit 32. At the same time, selection relay 11 is de-energized by the output "0" of "OR" circuit 31, and is switched over to the oxygen sensor 8 side as indicated in Fig. 2 so that the system is controlled in such a way that three-way catalyst 7 in the active cylinder group side consisting of cylinders f4 ~ f6 can exhibit high conversion efficiency.

When this partial cylinder operation condition continues for a long time, or during the engine warming-up period, the exhaust gas temperature entering the catalyst decreases. If the temperature becomes so low that catalyst 9 and oxygen sensor 10 can no longer function properly, low temperature detector 17 outputs

the level "1" signal to force the feedback signal to assume the "clamp" condition through clamp circuit 20. When the "clamped" signal value is applied to EGI circuit 15, the air-fuel ratio is controlled to hold at a specified fixed value. In this case, however, the control accuracy becomes slightly lower than in the case of feedback control, resulting in the situation that the function of three-way catalyst 9 tends to become degraded. In order to end this condition as quickly as possible, it is best to resume full cylinder operation. To comply with this requirement, in this invention, the output of low temperature detector 17 is input to "OR" circuit 31 to make cylinders f1 ~ f3 active whenever the low temperature detection signal (level "1" signal) is output, regardless of the output level of flip-flop 30. As a result of this forced restoration of full cylinder operation, when the exhaust temperature increases gradually to restore the function of three-way catalysts 7 and 10 (sic), and as long as the engine is in the light load condition during this period, the system is switched back to the 3-cylinder operation mode, provided that the clamp signal is retracted.

Next, the operation of VCS circuit 16 is briefly described here. Since the output of EGI circuit 15 is directly applied to fuel injection valves 2d ~ 2f for cylinders f4 ~ f6, the cylinder group consisting f4 ~ f6 is always in the active state. Although other cylinders f1 ~ f3 are in the active state as long as "AND" circuit 32 gate is open, they assume the inactive state when the output level of flip-flop 30 becomes "0" and low temperature detector 17 is not generating the detection signal (output of "0"). In other words, when the detection signal is output, cylinders f1 ~ f3 retain the active state even when the output level of flip-flop is "0." Moreover, the output level of flip-flop 30 becomes "1" when pulse width (W) is greater than the standard ( $W_g$ ) or when rpm (N) is lower than the standard value ( $N_0$ ) (the 6-cylinder region in Fig. 3), and it becomes "0" when pulse width (W) becomes lower than the standard ( $W_g$ ) and rpm (N) becomes higher than the standard ( $N_0$ ) (the 3-cylinder region in Fig. 3). Since the "set" input terminal of flip-flop 30 is connected to "OR" circuit 28, and the "reset" input terminal of flip-flop 30 is connected to "AND" circuit 29, the region indicated by "maintain the same number of cylinders" in Fig. 3 is formed.

As explained above, according to this invention, it is possible to always maintain a high catalytic conversion efficiency of the three-way catalyst since the variable cylinder control is interrupted when the oxygen sensor is at the temperature condition under which it does not function properly, and full cylinder operation is maintained even under the light load condition to achieve a rapid temperature increase in the entering exhaust gas to restore the three-way catalyst function. Compared with the system in which variable cylinder control is performed by detecting engine coolant temperature, since in this invention variable cylinder control is performed by detecting the low temperature condition of the oxygen sensor that is sensitive to temperature change, it is possible to obtain accurate controls having good response characteristics. Another effect is that the system configuration is not complicated and is less expensive.

#### Brief Explanation of Figures

The figures show one working example of this invention. Figure 1 is a simplified configuration diagram of the overall system, Fig. 2 is a block diagram of the control system, and Fig. 3 explains the variable cylinder control pattern.

f1 ~ f6. . . Cylinders

- 2a - 2f ... Fuel Injection Valves
- 8 and 10 ... Oxygen Sensors
- 12 ... Air-Fuel Ratio Control Circuit
- 15 ... Fuel Injection Control Circuit
- 16 ... Variable Cylinder Control Circuit
- 17 ... Low Temperature Detector

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Amendment

Sept. 25, 1979

To:

Honorable N. Kawahara, Director General

Japanese Patent Office

1. Case Identifier

1978 Patent No. 86996

2. Title of Invention

Fuel Supply Control Variable Cylinder System

3. Party Filing Amendment

Relationship to Case: Patent Applicant

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5. Date of Amendment Order: Voluntary

6. Subject of Amendment

Item "Claim(s)"

7. Description of Amendment

1) "Claim(s)" on page 1 or 2 of Specification shall be amended as follows:

"Claim(s)

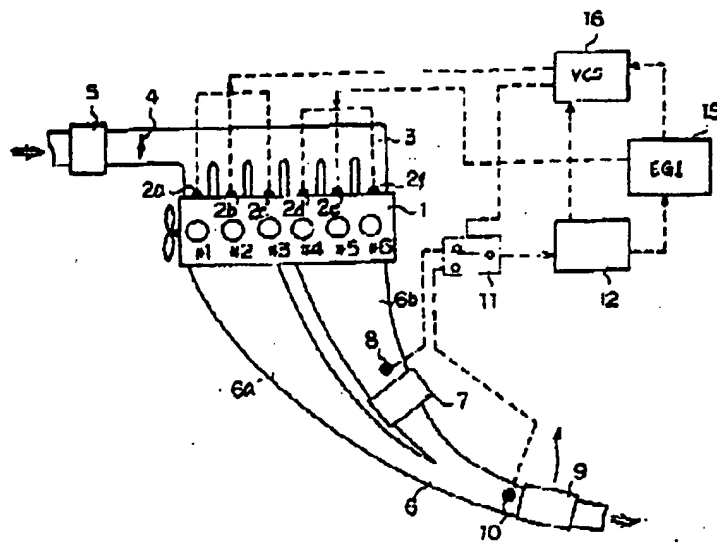
1. A fuel supply control type variable cylinder system for multi-cylinder engines equipped with a fuel supply system and a variable cylinder system control circuit that permit partial cylinder operation by shutting off the supply of fuel to a specified group of cylinders from the fuel supply system depending on engine load, comprising a three-way catalyst and a first oxygen sensor located in the exhaust passage of the active cylinder group; a three-way catalyst and a second oxygen sensor located in the merged passage

where the exhaust passage of inactive cylinder group meets the downstream of the exhaust passage mentioned above; a selection circuit that selects the output of the first oxygen sensor under partial cylinder operation or the output of the second oxygen sensor under full cylinder operation depending on the shut-off of the variable cylinder system circuit mentioned above; a temperature detection means that detects the temperature of the three-way catalyst in the merged passage; and an air-fuel ratio control circuit which interrupts the shutting off operation of the fuel supply signal mentioned above when the temperature detection means detects that the temperature is below a specified value, while interrupting the air-fuel ratio control that controls the fuel supply signal in a manner so as to make the air-fuel ratio become equal to the stoichiometric value.

2. The fuel supply control type variable cylinder system described in claim 1, a unique feature of which is that its temperature detection means mentioned above represents a circuit that determines the temperature by detecting that one portion of the fuel supply signal is shut off and that the output of the second oxygen sensor is higher than a specified value."

# FIGURES

Fig. 1



# FIGURES

Fig. 2

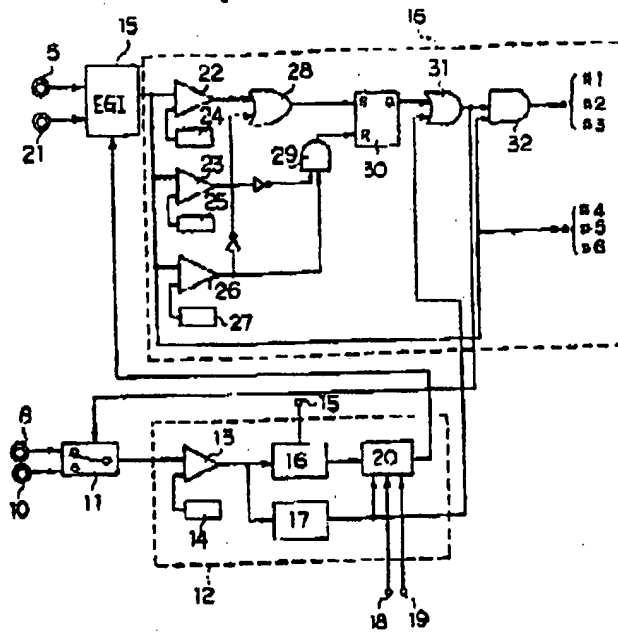
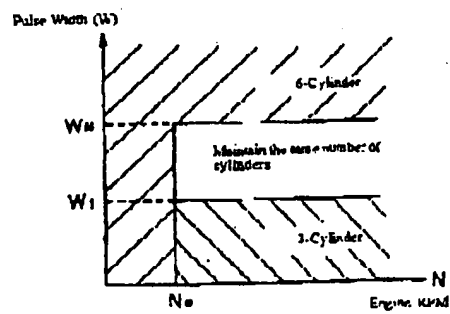


Fig. 3



④ 日本国特許庁 (JP)  
 ③ 公開特許公報 (A)

④ 特許出願公開  
 昭55-29002

⑤ Int. Cl.  
 F 02 D 17/00  
 5/02

識別番号

庁内整理番号  
 7910-3G  
 A355-3G

⑥ 公開 昭和55年(1980)3月1日

発明の数 1  
 審査請求 有

(全 6 頁)

⑦ 燃料供給気流制御装置

⑧ 特 願 昭53-86996  
 ⑨ 出 願 昭53(1978)7月17日  
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発 明 の 名 称

燃料供給気流制御装置

特許請求の範囲

1. 燃料供給量を制御する燃料供給装置と、燃料供給装置からの所定の気流をグループへの燃料供給管とエンジン負荷に応じて調節して燃料供給量とする燃料供給制御回路とを備えた内燃機関エンジンにおいて、燃料供給グループの排気通路に設けた三元触媒と第1の酸素センサと、上記排気通路の下流の休止通路の排気通路との合流通路に設けた還元触媒と第2の酸素センサと、上記燃料供給制御回路の基端に於いて燃料供給調節時は第1の酸素センサの出力を、燃料供給調節時は第2の酸素センサの出力を選択する選択回路と、合流通路の三元触媒の温度を検出する温度検出手段と、前記温度検出手段が所定温度以下を検出した時に上記燃料供給回路が調節を中止すると共に、燃料比が濃燃空燃比になるとように上記燃料供給量を制御する濃燃比

制御を中止する濃燃比制御回路とを備えたことを特徴とする燃料供給気流制御装置。

2. 上記温度検出手段は、上記燃料供給管の一端が通孔され、且つ第3の酸素センサの出力が所定値以上であることを検出して濃度を判別する回路であることを特徴とする特許請求の範囲第1項記載の燃料供給気流制御装置。

発明の詳細な説明

本発明は内燃機関に還元触媒を備えて濃燃比を目標値にフィードバック制御する装置を備えた燃料供給気流制御装置エンジンに関し、とくに、燃料供給量の低下したときには必ずしも燃料供給量に使用されることにより、燃料消費化作用を低下せまいようにした装置を提供するものである。

一般にエンジンを高負荷状態で運転すると燃費が悪くなる傾向があり、このため多量にエンジンにおいて、エンジン負荷の小さいときは一時的に燃料供給量を停止し、残りの燃料供給量の単位燃費あたりの負荷を相対的に高め、燃費悪化の損失を改善するようにした装置

敵制郵マソリンが考えられた。

一方、エンジン内の燃焼対策のために、排気系に三元触媒を設置するとともに、その上流に排気センサ（酸素センサ）を設置し、このセンサ出力にもとづいて空燃比を目標空燃比とをなすようにフィードバック制御し、三元触媒による $\text{HC}$ 、 $\text{CO}$ の酸化と $\text{NO}_x$ の還元を共に効率よく行わせるシステムが知られている。

この要點は制御レバラムキ上配気筒制御エンジンに適用する。一部気筒グループを停止状態のときは、この停止状態から排出された蒸気と、後面気筒から排出される過剰蒸気とが混合した状態で、噴霧センプ、三元触媒を通過するため、噴霧センプの出力は、噴霧過剰状態を排出して空燃比を正確に保つるようなフィードバック制御が行われ、おつて燃費性能を促すセヤすい。

このため、呼吸運動する気管の伸張運動と、休  
止気管及び運動気管の分岐伸張運動とにそれぞれ  
緊張センサと三元油圧を設けし、一部気管停止時  
には運動気管の伸張のみが通る限流セリタの出力

たことを告知したり、無情飲酒を停止して金銭  
難滞に及し、財産損失の過半を上げを促す  
ことが考えられる。このため既に特別に注意せ  
らるべきところ、アムステルダムが覆けられたい。

また、コンパシの優待次第、税關事務本局を  
快知することにより行ひ、同じく優待制度を伸  
止することも考へられが、依然として上記した  
金融機關新設行時の問題は解決されず、しかも店  
家数は低下しやすい。

ところで、上記低価格のフィードバック制御システムにおいて、三元制御と両側に酸素センサも使用になると、その出力特性が酸素濃度に対する比例関係から外れて変曲する傾向があり、このため低酸素時にはフィードバック制御の精度が低下しやすくなる。

そこで、通常は暖房キンの出力状態から室温を判別して所定室温値以下のときは、フィードバック信号をランプして空燃比を固定値に保持し、フィードバックより空燃比制御を一時的に中止するようになっている。

時間 前5—2802(2)  
 まもとにしてフイ—ドボグタ製餅を行い、地味美  
 しい空色比を産け田産空色比とあるようにして、  
 銀葉、並びに餅氣の肉性説と共に良野と評せら  
 れることも見えしめる。

ところで、エンゾンの脱炭素途中や一部炭素還  
原が長時間にわたり継続するとミミドは、恒定的  
に脱炭素度が低下し、とくに下流側の三元炭素は  
休止状態からの放出反応の発生もあって、還元度  
度は正味の活性状態に比べて大幅に組成低下する  
とされがえる。

このように酸素濃度が低下すると、その次に全気配管網に空留したときは、この下流側の三元放散は節減に良好な反応状態が得られず、このため排気設備が部分的ではあるが低下することになる。例えば、長い配管で下り管を一般低圧配管により進行した後に上り管を置換するような場合、上配しんようを調整が容易やすい。

このような問題を回避するため、供給路の  
二元化を図りそれぞれ温度を調整しておき、該  
温度を調整により放熱面が所定温度以下に低下し

本発明はかかる点に鑑み、気筒制御用エンソンの過熱劣化を回避するため、部分気筒運転中燃焼気筒の三元触媒の排気入口附近に設けられ、したがって三元触媒の温度にほぼ近似的な温度特性をもつ温度センサの出力にもとづいて燃焼制御を行ひ下流側の三元触媒の温度が所定値以下に低下したら空燃比のフィードバック制御で中止すると同時に気筒制御も中止して必ず全気筒運転に戻すようにすることにより、全ての気筒から排気される燃焼気筒によつて三元触媒の温度を適やかに上昇させ、三元触媒の過熱低下を防止し、常に良好な排気浄化作用を維持するようにした燃焼供給気筒制御用エンソンを提供することを目的とする。

以下、国書にもとづいて本発明の実施例を説明する。

1 は 8 気筒エンジン本体、2 1-4 は推進するときに過負荷時に作動を休止する風門、4-4 は常時作動する風門、2 4-2 1 は各気筒の風門ポートに取り付けられた燃焼制御弁、3 は吸

気管、6はスロットルバルブ、5は吸入空気量センサ、6a、6bは排気管で吸気ゲージ1~4と6a~6bに対応して区画される。7は排気管6bに取り付けられた三元触媒、8はこの三元触媒7の入口近傍に設置された酸素センサ、9は排気管6a、6bの合流管6に取り付けられた三元触媒、10は三元触媒9の入口近傍に設置された酸素センサである。

供給する空気量制御回路16からの信号により切替作動する選択リレー11を介して酸素センサ8、10の出力が選択的に入力される空燃比コントロール回路12は、第2図に示すようにセンサ出力を比較基準電圧と比較する比較器13、運転空燃比に相当する基準電圧を出力する基準電圧発生器14、端子15より基本パルスを受ける補正電圧発生器16、酸素センサ10の低電圧状態を検出する触媒装置故障検知器17、この検知器17からの低電圧信号や端子18、19からの全開出力時のフリップフロップイグニッション信号と吸気時のフリップフロップ信号を受けてアイドストップ制御をクラッチ（吸気

センサ8又は10の出力値に比例する空燃比アイドストップ値を所望値に固定する）するクラッチ回路20とで形成される。

空燃比コントロール回路12からの空燃比制御信号と、吸入空気量センサ5、過給機センサ21とからの信号に基づいて燃料噴射量を決定する燃料噴射制御回路（BOI回路）15の出力は、燃料噴射弁22~25に対しては直接印加されるが、他の燃料噴射弁26~29へは過給機制御回路（以下VCG回路）16を介して印加される。このVCG回路16で燃費削減を判断すれば、燃料噴射弁22~29への燃料供給はカットされ、気筒1~4は停止状態になる。また同時にVCG回路16の上記燃費削減の減少指令により、選択リレー11は燃費気筒4~6専用の酸素センサ8側に切り換えられるようにになっている。

VCG回路16はBOI回路15からの燃料噴射バルブ信号を参照として燃費削減時には燃料噴射弁22~29へ送らないようにして気筒1~4を停止状態にするもので、燃費削減における燃

油燃費の改善をねらいたする。その基本的原理は、原則として燃費削減に比例したパルス幅をもつ燃料噴射信号のパルス幅比較器22、23、基本燃費と高負荷に対応したパルス幅設定値(W<sub>H</sub>)、(W<sub>L</sub>)を比較基準値として出力するパルス幅設定器24、25、エンジン回転数比較器26、一定の低回転数設定値(N<sub>O</sub>)を基準値にする回転数検出器27、そしてOM回路28とAND回路29の出力をスリット入力(S)とリセット入力(R)とするフリップフロップ30、このフリップフロップ30と上記空燃比コントロール回路12の低燃費検知器17との出力を入力とするOR回路31、OR回路31とBOI回路15の出力を入力とするAND回路32とからなる。つまり、OR回路31の入力側に低燃費検知器17を接続するため、酸素センサ8、10が低電圧のときには、VCG回路16の一部燃料停止指令を制御回路構成にしている。

次に本発明の作用を説明する。まずエンジン回転数(N)と燃料噴射パルス幅(W)が第3図に示された燃費領域にあるときは、燃費であるようにV

CG回路16のフリップフロップ30の出力レベルは"1"となり、気筒1~4を燃費状態にする、即ち全気筒運転を行う。これに伴いBOI回路15の出力"1"を受けて選択リレー11が動作されて切替作動し、全気筒の酸素濃度を検出する酸素センサ10の出力が空燃比コントロール回路12に入力する。燃費中の酸素濃度を運転空燃比に対応する基準電圧14の基準値と比較する比較器13の出力は、補正電圧発生器16において基本パルスとの偏差信号を放出し、クラッチ回路20を通過してBOI回路15へフィードバックされる。これによつて三元触媒10が適正に機能するように空燃比が所望値を燃費に収束させられるのである。ここで検出が燃費状態になり、パルス幅(W)とエンジン回転数(N)が高燃費領域に移行すると、フリップフロップ30の出力レベルは"0"となり気筒1~4を停止状態にする。なおこのとき低燃費検知器17は酸素センサ10が所定値以下の低電圧状態でないという信号、即ちレベル"0"を出力しているために

0 図回路 21 の出力は“0”となり、AND 回路 22 のゲートを閉じる。同時に 0 図回路 21 の出力“0”により選択リレー 11 は動作が解かれて、第 2 図に示す如く、取巻センサ 8 側に切り換え、取巻機アールプ 4-1+6 側の三元電圧が高くなり、取巻機を駆動するようにコントロールする。

ところで、この一側取巻停止状態が長く続いたり、あるいは取巻機運転時は取巻機入排気温度は低下する。いまだ第 9 図取巻センサ 10 が過電圧出力を発揮しない程度に低下すると、低電圧検知 17 がレベル“1”を出力してクランプ回路 20 を介してフィードバック信号をクランプ回路 20 に与え、クランプされた信号が 0 図回路 15 の加算されると、取巻機に所定の回数を保持されるように制御されるが、この場合だけ、フィードバック制御に比べて電圧が若干低下するため、三元電圧の機能は低下しがちになる。このような状態からでも若干だけ下げ出すためには全取巻運転時に戻すことが好ましく、そこで本発明は低電圧検知 17 の出力を 0 図回路 31 に入力し、フリフ

フアンプ 30 の出力レベルに調整なく、低電圧時の検出信号(レベル“1”)を出力したときは、取巻機 1-1+3 を駆動状態にする。このようにして全取巻運転に自動的に復帰させた結果、排気温度が次第に上昇して三元電圧 7、10 の機能が回復すると、クランプ信号の解除を条件として、このとき取巻機をさらば再び低電圧状態に切り換わるのである。

ここで V C 8 回路 15 の作用を簡単に説明すると、R O I 回路 15 の出力が取巻機 4-1+6 の燃料供給弁 2-2 に対しては直接的に印加されるために、この取巻アールプ 4-1+6 は常時駆動状態にある。他の取巻機 1-1+3 は AND 回路 22 のゲートが開いていないときは駆動状態になるが、フリフアンプ 30 の出力レベルが“0”で、かつ低電圧検知 17 が検知信号を無しでないとき(出力は“0”)に停止状態になる。減速すると、検知信号が出力されているときは、フリフアンプ 30 の出力レベルが“0”でも取巻機 1-1+3 は駆動状態を維持する。セカンダリアンプ

プ 30 の出力レベルはレベル信号値(W)が基準値(WN)以上か又は低電圧(N)が基準値(N0)以下の場合(第 3 図の 6 気筒領域)には“1”になり、レベル信号(W)が基準値(WN)以下で、かつ低電圧(N)が基準値(N0)以上の場合(第 3 図の 3 気筒領域)には“0”になる。フリフアンプ 30 のセント入力端子を 0 図回路 25 に、リセット入力端子を AND 回路 22 の入力端としたため、第 3 図の低電圧保持の領域が形成される。

以上のようにならば、取巻センサが過電圧に作動しない低電圧状態のときは低電圧制御を停止し、たとえ取巻機でも全取巻を駆動状態に保ち、適当な取巻機入排気温度の上昇を促して三元電圧の機能を回復させるので、常に高い取巻機を維持することが出来る。また低電圧制御を強制冷却水を感知して行なうの compared 比べ、温度変化に低電圧を感測センサの低電圧状態を感知して行なうため、その応答性が良好で正確な制御が得られると共に、運転が安定化セブ安くなる効果を有する。

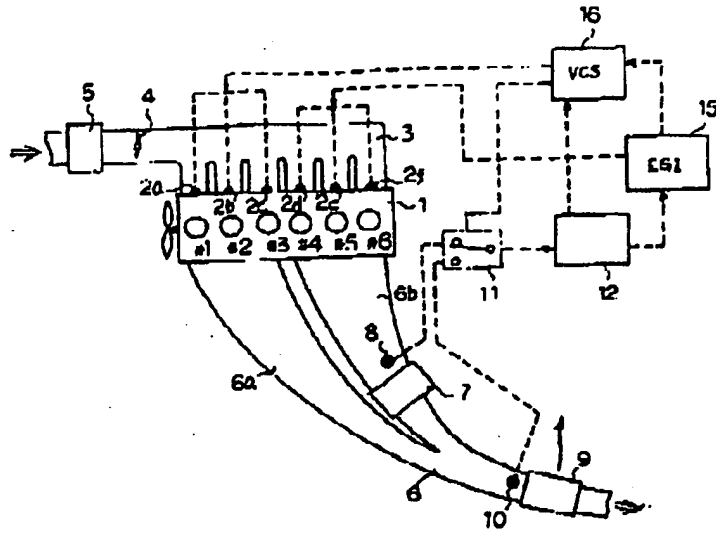
#### 図面の簡単な説明

図面は本発明の実施の一例を示すもので、第 1 図は取巻機構成、第 2 図は取巻機のアールプ図、第 3 図は低電圧制御モードの概略図である。  
4-1+6-気筒、2-2-燃料供給弁、1-1+3-燃料供給弁、8、10-取巻センサ、12-取巻機コントローラ回路、15-燃料供給制御回路、16-低電圧検知回路、17-低電圧検知。

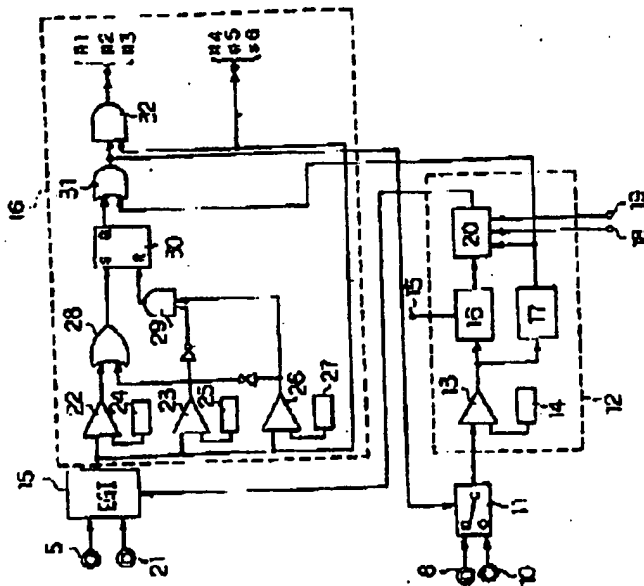
特許出願人 H 富士自動車株式会社

代理人 弁護士 豊 田 敬 一

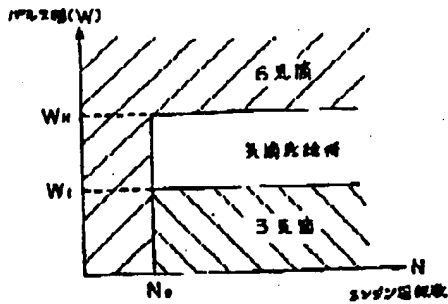
第 1 圖



第 2 圖



### 第3図



#### 2. 補正の内容

- 1) 補正部1頁乃至2頁の「特許請求の範囲」を次のように補正する。

##### 「特許請求の範囲」

1. 燃料供給量と制御する燃料供給装置と、前記燃料供給装置からの所定の燃料供給グループへの燃料供給量をエンジン負荷に応じて調節して部分負荷運転する燃料供給制御装置とを備えた多気筒エンジンにおいて、燃料供給グループの所定値に設けた三元触媒と第1の燃費センサと、上記燃料供給の下流の排気管の所定値に設けた三元触媒と第2の燃費センサと、上記燃料供給の制御装置の調節に応じて部分負荷運転時は第1の燃費センサの出力を、全負荷運転時は第2の燃費センサの出力を基とする燃費制御と、各燃費制御の三元触媒の温度を検出する温度検出手段と、前記温度検出手段が所定温度以下を検出し、かつ、上記燃料供給装置の調節を中止すると共に、空燃比が燃費制御比になるように

特許庁長官 川 田 雄 一

#### 1. 事件の表示

昭和53年特許第86994号

#### 2. 発明の名称

燃料供給装置制御装置

#### 3. 補正をする者

事件との関係 特許出願人

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氏 名 (755) 弁護士 伊 藤 政 孝

#### 5. 補正命令の日付 白鳥

#### 6. 補正の対価

明細書中「特許請求の範囲」の欄



上記燃料供給量を制御する空燃比制御を中止する燃料供給制御装置とを備えたことを特徴とする燃料供給装置制御装置。

2. 上記燃料供給装置は、上記燃料供給装置の一方が燃費センサと、かつ第2の燃費センサの出力が所定値以上であることを検出して燃費を制御する燃費制御とを特徴とする特許請求の範囲第1項記載の燃料供給装置の制御装置。